THE REALITY OF MORPHOPHONEMES

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The importance of the morphophoneme as a structural unit has not been fully recognized. Post-Bloomfieldians explicitly rejected this unit and methods of description making use of it. This paper contends that morphophonemes are indeed required for the most efficient description of morpheme alternants. It is further argued that morphophonemes are real phonological units and not simply abstractional fictions. These points are illustrated by a problem in Tera, a Chadic language of northern Nigeria. In order to account for word-final vowel alternations, some /i/'s must be interpreted as the morphophoneme |ə|, others as |i|. Surprisingly, allophones of preceding consonants are variably determined by these underlying morphophonemes.

1. This paper was inspired by Sapir's well-known 1933 article reprinted with the title 'The psychological reality of phonemes' (Sapir 1949).[1] In that work, Sapir took the position that phonemes are not simply convenient groupings of phones used by linguists for analytical purposes, but are units having psychological reality. This argument was rejected two years later by Twaddell in his now classic paper 'On defining the phoneme', in which he answered that 'it is inexpedient and probably impossible ... to associate the term [phoneme] with a reality ...' (1935:33). Twaddell concluded that it was best to treat the phoneme as 'an abstractional fiction'. While it is true that this extreme operationalist position was attractive to the linguistic profession from a philosophical point of view, in practice linguists have behaved since Twaddell's time AS IF phonemes were real elements.[2]

1.1. The status of the MORPHOPHONEME, on the other hand, is quite different. To the extent that the morphophoneme has been accepted at all in recent times, it has clearly been regarded as 'an abstractional fiction' useful for describing certain morphemic alternations, and nothing more. Unlike 'phoneme', which is a primitive term, 'morphophoneme' is essentially a derivative concept, i.e.

$$\begin{array}{ll} \text{morphophoneme} & < \text{ morphophonemics} \\ \text{phoneme} & > \text{ phonemics.} \end{array}$$

The subordinate status of the term morphophoneme can be seen from the nature of its use (or lack of use) in the literature of linguistics. For example, neither of the standard linguistics textbooks (Gleason 1961, Hockett 1958) has the term morphophoneme in the index, but both do have morphophonemics. A recent study by Schane (1966) of French morphophonemics from a generative point of view makes use of morphophonemic representation, but without ever

[1] This study is a revised version of a paper originally presented to the Yale Linguistic Club. This version has benefited from the criticisms and comments made on that occasion. Field research in Nigeria during 1965–66 was supported by the Foreign Area Fellowship Program. I am also grateful for the assistance of the Institute of African Studies, University of Ibadan.

[2] This statement excludes the recent Chomsky-Halle position.

using the term morphophoneme.[3] Thus, while the phoneme has always played an indispensable role in phonemic studies, a large portion of American morphophonemic studies during this century has not made use of the morphophoneme as such.

The major thesis of this paper is that the most efficient description of morpheme alternants requires the use of morphophonemes, and, moreover, that these morphophonemes do in fact constitute psychologically real units.

1.2. There was a short period between approximately 1939 and 1945 when morphophonemes were used in describing morpheme alternants. The procedure was described by Bloomfield in his 'Menomini morphophonemics': 'The process of description leads us to set up each morphological element in a theoretical *basic* form, and then to state the deviations from this basic form which appear when the element is combined with other elements' (1939:105). The units of which the basic forms were composed were called morphophonemes.

1.3. Objection to morphophonemes during the heyday of American distributional linguistics stemmed from the beliefs that (a) morphophonemes are not real while phonemes are, and that (b) they require dynamic statements, which represent an erroneous contamination from historical linguistics. Harris, in his review of Emeneau's *Kota texts*, which made use of morphophonemes, suggested that a preferable approach would be 'to speak directly in terms of the *observable* morphemes and phonemes' (1945:286). Lounsbury explicitly chose item and arrangement for his description over Bloomfield's approach because 'this allows us to deal always with ACTUAL phonemic forms ...' (1953:17).

It does not appear that adherents of the Bloomfieldian method differed from their critics regarding the fictitious status of morphophonemes and base forms. Bloomfield referred to his base forms as THEORETICAL in contrast to 'phonemic forms of the ACTUAL Menomini language' (115). Emeneau (1944) explicitly followed Bloomfield in speaking of theoretical base forms. Swadesh and Voegelin (1939:5) wrote of constructing morphophonemic FORMULAE. Similarly, Hockett (1948) labelled his section in which morphophonemic symbols are rewritten into phonemes, 'From FORMULAE to phonemics'.

The rejection of morphophonemes by Harris and other proponents of item and arrangement analysis was thus due not to a new discovery that morphophonemes were fictitious, but rather to a philosophical commitment, in line with the prevalent naïve empiricism of the day, to avoid fictitious units—since only descriptions which dealt with patently observable units could be regarded as scientific.

1.4. The other serious objection to the Bloomfieldian use of morphophonemes and rewrite rules was that dynamic statements were invalid because their use was primarily the result of a failure to completely distinguish synchronic from diachronic description: 'The preference for the dynamic conception is due to the predominantly historical interest of most linguists, especially during the 19th and early 20th centuries' (Wells 1949:112). The commonplace allegation that 'the process or rewriting formulation ... crept into morphophonemic description from diachronic linguistics ...' can still be heard to this day (Lamb 1966:551). This

[3] Schane speaks of 'underlying phonological representation'. It is not clear whether the word 'representation' was purposely used rather than 'unit' so as to avoid the question of the status of the abstract units employed.

charge that dynamic statements are due to a confusion between synchronic and diachronic linguistics has been made so often and for so long that it is hard to realize that the objection is completely without foundation. All such criticisms have been made without giving recognition to the explicit disclaimers made by Bloomfield and his followers that their method had any connection with historical description. For example, Wells (113) asked whether Swadesh and Voegelin's morphophonemic formulae 'represent not only historical realities but synchronic realities of some sort as well', thereby implying that Swadesh and Voegelin did indeed ascribe at least historical reality to their morphophonemes. But on what basis did Wells introduce the factor of historical reality, when Swadesh and Voegelin had stated explicitly that their formulae were NOT intended as historical reconstructions? 'The most efficient formulation of the synchronic facts is ordinarily not the same as the reconstruction of the actual historical developments' (Swadesh and Voegelin, 2). Bloomfield was even more direct on this point: 'Our basic forms are not ancient forms ... and our statements of internal sandhi are not historical but descriptive, and appear in a purely *descriptive order*' (106). Apparently Harris understood this in 1944 when he wrote: 'The difference between two partially similar forms is frequently described ... as a process which yields one form out of the other ... It has, of course, nothing to do with historical change or process through time ... ' (1944:199). The 'of course' in Harris' quote has been proved to be highly inaccurate by twenty years of misstatement regarding the relationship between synchronic and diachronic rules.

Thus, of the two serious objections to morphophonemes—fictitious status and confusion with diachronic linguistics—the first is irrelevant, even if true, and the second is definitely erroneous.

2. I should now like to describe a problem of morpheme alternation in Tera, a Chadic language of Northern Nigeria, to illustrate my thesis that morphophonemes are not only indispensable for descriptive purposes, but are in fact real phonological units, not simply abstractional fictions as earlier thought.[4]

2.1. Tera, like most other languages of the Biu-Mandara branch of the Chadic family, has six vowel phonemes:

i	ə	u
e		o
	a	

All six vowels occur in closed and open syllables with the exception that /ə/ does not occur before juncture.[5]

2.2. Morphophonemic alternation is not common in Tera. The alternation that does occur usually involves word-final /i/.

(a) Some nouns ending in /i/ in citation form have alternants without the final vowel when followed by another word; some nouns ending in /i/ have alternants with /ə/ when not sentence final; still other nouns ending in /i/ retain the /i/ in all positions.[6]

[4] The position of Tera within the Chadic family is described in Newman and Ma (1966).

[5] Closed and open refer to syllables of the form CVC and CV respectively.

[6] /ɓ ɗ ʃ ǧ/ are glottalized implosive stops; /mb nd nj ŋg/ are prenasalized stops (unit phonemes); /ɮ ʂ/ are voiced and voiceless lateral fricatives; # is phonological juncture.

	BEFORE #	NOT BEFORE #	
(1)	na sedi	na sed ɓa	'This is (not) a snake'
(2)	na deɓi	na deɓ ɓa	'This is (not) gum'
(3)	na pərsi	na pərsə ɓa	'This is (not) a horse'
(4)	na wudi	na wudi ɓa	'This is (not) milk'
(5)	na saɓi	na saɓi ɓa	'This is (not) a stick'
(6)	na muĝdi	na muĝdi ɓa	'This is (not) bamboo'.

(b) Most polysyllabic verbs ending in /i/ have non-final alternants without the vowel. A few verbs ending in /i/ have non-final alternants with /ə/. There are no polysyllabic verbs which have a final /i/ in all positions.

	BEFORE #	NOT BEFORE #	
(7)	dala wa wudi	dala wa wud koro	'Dala pointed (at a donkey)'
(8)	dala wa mbuki	dala wa mbuk koro	'Dala threw (at a donkey)'
(9)	dala wa ɓəṣi	dala wa ɓəṣ koro	'Dala hit (a donkey)'
(10)	dala wa kədi	dala wa kədə koro	'Dala pulled (a donkey)'.

(c) Monosyllabic /i/ verbs fall into two classes. Some have non-final alternants with /ə/; others retain the /i/ in all positions. There are no monosyllabic verbs which occur without a final vowel.

	BEFORE #	NOT BEFORE #	
(11)	dala wa di	dala wa də goma	'Dala went (to market)'
(12)	dala wa ẓi	dala wa ẓə sule	'Dala received (a shilling)'
(13)	dala wa vi	dala wa vi ẓu	'Dala roasted (meat)'
(14)	dala wa ẓi	dala wa ẓi sule	'Dala paid (a shilling)'.

Note particularly 12 and 14, which are phonetically identical in prejunctural position, but which contrast when non-final.

(d) Before a vowel suffix, words ending in /i/, whether nouns or verbs, fall into two alternation classes. Some words retain the /i/ while others have a vowelless alternant. There are no forms with /ə/ before a vowel suffix.

	BEFORE #	BEFORE VOWEL	
(3a)	pərsi	pərs-a	'horse; the horse'
(8a)	mbuki	mbuk-u	'to throw; throw!'
(10a)	kədi	kəd-u	'to pull; pull!'
(11a)	di	d-u	'to go; go!'
(12a)	ẓi	ẓ-u	'to receive; receive!'
(4a)	wudi	wudi-a	'milk; the milk'
(13a)	vi	vi-u	'to roast; roast!'

The words which retain /i/ before the vowel suffix are the same words which are invariant whether in medial or final position. The words with vowelless alternants before vowel suffixes include both those words which medially have vowelless alternants and those having alternants with /ə/. On the basis of the three environments, pre-junctural, sentence medial, and pre-vocalic, all Tera words ending in /i/ in citation form can be assigned to one of three groups: those words with the same form in all environments, those with two forms, and those with three forms.

		BEFORE #	NON-FINAL	BEFORE VOWEL
INVARIANT	'milk'	wuḏi	wuḏi	wuḏi
	'to roast'	vi	vi	vi
2 ALLOS	'to throw'	mbuki	mbuk	mbuk-
	'to hit'	ɓəṣi	ɓəṣ	ɓəṣ-
3 ALLOS	'horse'	pərsi	pərsə	pərs-
	'to go'	ḏi	ḏə	ḏ-

2.3. How can we best account for these alternations? The facts are quite clear and could easily be described by listing three forms for each word as in the above; but such a listing hardly qualifies as insightful explanation. Choosing one of the alternants as basic and providing general rules to account for the shape of the other allomorphs is a better approach. A guiding principle is to look for a base form such that the other forms are automatically predictable in specified environments. This principle rules out the selection of the citation form as the base, since, given a word with a final /i/, it is not possible to automatically predict the other forms. For example, given the citation form /ẓi/, there is absolutely no way to predict whether the non-final form will be /ẓi/ 'pay' or /ẓə/ 'receive'.

Selection of the prevocalic form as the basic allomorph looks more promising. There would then be two types of bases, those ending in /i/ and those ending in a consonant. The non-alternating forms would all have /i/ in the underlying base, while the words with allomorphs would have consonant-ending bases, e.g. */wuḏi/ 'milk', */ẓi/ 'to pay', */wuḏ/ 'to show', */ẓ/ 'to receive'. To account for the citation form, these consonant-final bases would undergo a general rule stating that forms ending in a consonant automatically add /i/ before juncture. The /ə/ which is found at the end of words such as */ẓ/ 'to receive' and */pərs/ 'horse', when sentence-medial, could be treated as an epenthetic vowel inserted to preserve Tera syllable structure.

The use of consonant-final bases with vowel addition rules does account for most cases of alternation, but this analysis proves inadequate when more data are introduced. A particularly interesting counter-example concerns the specification of the allomorphs of the attributive morpheme. Generally speaking, the allomorph /kandi/ is added to vowel-final adjectives, while /ndi/ is added to consonant-final stems, e.g.:

(15)	saɓir taḏa-kandi	'a heavy stick'
(16)	saɓira taḏa	'The stick is heavy'
(17)	saɓira taḏa ɓa	'The stick is not heavy'
(18)	saɓir teɓer-ndi	'a straight stick'
(19)	saɓira teɓer	'The stick is straight'
(20)	saɓira teɓer ɓa	'The stick is not straight'.

However, there appear to be exceptions to the general rule:

(21)	saɓir kər-kandi	'a long stick'
(22)	saɓira kəri	'The stick is long'
(23)	saɓira kər ɓa	'The stick is not long'.

Example 21 seems to contradict the general statement that adjectives ending in a consonant take the attributive allomorph /ndi/ (as in 18). The apparent exception neatly falls under the general rule, however, if one assumes that the

underlying base does not end in a consonant but rather contains a final vowel, and that the rule which determines the proper allomorph of the attributive morpheme precedes the vowel-dropping rule. The derivation for /kər-kandi/ would thus be /*kəri/ + attributive > / kəri-kandi/ > kər-kandi/.

The hypothesis that consonant-final roots automatically add /i/ in pre-junctural position breaks down, moreover, because there are some consonant-final nouns and adjectives in Tera which simply do not add a final vowel.

	BEFORE #	NOT BEFORE #	
(24)	na ruf	na ruf ɓa	'This is (not) a baboon'
(25)	tin zoɓ	tin zoɓ ɓa	'She is (not) a slob'
(26)	na gomok	na gomok ɓa	'This is (not) a bushcow'
(27)	na ɓoŋ	na ɓoŋ ɓa	'This is (not) white'
(28)	na teɓer	na teɓer ɓa	'This is (not) straight'.

2.4. The procedure I have adopted to account for the alternations involving word-final /i/ is to set up base forms on the morphophonemic level rather than to choose a base from among the phonemically occurring allomorphs. My assumption is that the distributional gap in Tera vowels—the fact that /ə/ does not occur before juncture—is due to a neutralization which takes place between the morphophonemic and phonemic levels, and that morphophonemically |ə| does occur in final position.[7] As a solution to the alternation problem, I am postulating that those Tera words with alternants have a final |ə| in the base form, while those words which do not display alternation have |i| in the underlying base. I am suggesting that, although the phonemes /i/ and /ə/ do not contrast before juncture, there is nevertheless a morphophonemic contrast between |i| and |ə| in that position. A full list of morphophonemic base forms for the examples presented earlier in the paper shows final |ə| to be anything but rare.

WITH FINAL |ə|	WITH FINAL |i|	WITH FINAL |C|
(1) |səɗə| 'snake'	(4) |wuɗi| 'milk'	(28) |ruf| 'baboon'
(2) |dəɓə| 'gum'	(5) |saɓi| 'stick'	(29) |zoɓ| 'slob'
(3) |pərsə| 'horse'	(6) |muĝdi| 'bamboo'	(30) |gomok| 'bush-cow'
(7) |wuɗə| 'to point'	(13) |vi| 'to roast'	(31) |ɓoŋ| 'white'
(8) |mbukə| 'to throw'	(14) |ẓi| 'to pay'	(32) |teɓer| 'straight'
(9) |ɓəṣə| 'to hit'		
(10) |kədə| 'to pull'		
(11) |də| 'to go'		
(12) |ẓə| 'to receive'		
(26) |kərə| 'long'		

Given a set of base forms ending in the morphophoneme |ə|, the allomorphs which actually occur can be automatically generated by two simple rules: an MP rule which deletes |ə| except before juncture, and a P rule which alters |ə| to /i/.[8]

[7] Morphophonemes are enclosed in vertical bars.

[8] In my usage, the distinctive difference between MP rules and P rules is that MP rules make use of grammatical information (such as morpheme boundaries) while P rules do not.

MP Rule: |ə| > ∅ in env ___ X (where X is not #)
Condition: Rule void where not permitted by phonotactic rules.[9]

The rule states that all morph-final schwas are dropped when not utterance-final unless the result would be a phonemically impossible word. A description of a phonemically permissible word in Tera is provided by the formula ... CV(C_2) (where C_2 is not a voiced stop).[10] It follows from the formula that a morph-final |ə| occurring before a consonant cannot be dropped if the schwa is in a monosyllabic word or if it is preceded either by a voiced stop or by a consonant cluster (see 3, 10, 11). However, if the following unit is a vowel suffix, the schwa-dropping rule operates without exception, since the result will always be phonologically permissible.

P Rule: |ə| > /i/ in env ___ #

The morphophoneme |ə| before juncture is realized phonemically as /i/. There are no conditions and no exceptions.

(29) |dala wa mbukə koro| by MP Rule > /dala wa mbuk koro/ 'Dala threw at a donkey' (see 8)
(30) |mbukə-u| by MP Rule > /mbuku/ 'throw!' (see 8a)
(31) |dala wa mbukə| by P Rule > /dala wa mbuki/ 'Dala threw' (see 8)
(32) |dala wa ẓə sule| 'Dala received a shilling': no change; MP Rule voided by phonotactics (see 12)
(33) |ẓə-u| by MP Rule > /ẓu/'receive!' (see 12a)
(34) |dala wa ẓə| by P Rule > /dala wa ẓi/ 'Dala received' (see 12)

3. Because of the wide applicability of the above two rules, most words postulated to end in the morphophoneme |ə| never actually can be heard with that vowel. Either the vowel is deleted or it is heard as /i/. Since |ə| never phonetically occurs as such in these cases, one might ask whether schwa really exists or whether the symbol is just a shorthand way of marking an /i/ that alternates in contrast to one that does not.

In his 'psychological reality' article, Sapir presented examples of native-speaker reaction to support his contention that native perception of reality is not identical to physical reality. Sapir's purported aim was to demonstrate that phonemes possess psychological reality. As Harris (1951) and others have pointed out, Sapir did not at the time clearly distinguish between phonemes and morphophonemes, with the result that two of the five examples presented were actually cases of informants morphophonemically distinguishing between phonemically identical units.[11] Without knowing it, Sapir was presenting evidence for the psychological reality of morphophonemes. I have not duplicated Sapir's method of probing into native-speaker intuition by means of direct tests of informants; but I have discovered evidence concerning underlying psychological realities

[9] By stating the condition in this form, I implicitly endorse the position that phonotactics can be described outside the central generative apparatus.

[10] The glottalized consonants may occur as C_2. They make use of a distinct phonation type (glottalization) and are not considered to be voiced.

[11] Example II on Sarcee and example III on Nootka.

from a study of the Tera phonological system per se. This evidence, discovered in the course of formulating dialect transfer rules, indicates clearly that for Tera speakers |ə| does actually exist in final position, and thus confirms Sapir's findings about the psychological reality of the morphophoneme as a linguistic unit.

3.1. Within the Tera language, the dialect of the town of Zambuk is characterized by the occurrence of palatals before front vowels in place of corresponding alveolars in the dialect of Wuyo. The dialects are mutually intelligible and are practically identical except for this pronunciation difference.

	ZAMBUK	WUYO
(35) 'one'	[da]	[da]
(36) 'to get up'	[ji]	[di]
(37) 'my brother'	[xata]	[xata]
(38) 'his brother'	[xacin]	[xatin]
(39) 'to run'	[d̄a]	[d̄a]
(40) 'milk'	[wuĵi]	[wud̄i]

The relationship between the alveolars and the corresponding palatals in Zambuk is a straightforward case of phonetically similar complementation (supported by native-speaker reaction), leading to the obvious analysis that these pairs be treated as members of the same phoneme, as is the case of Wuyo. The problem is that there are cases in Zambuk of non-palatalized alveolars occurring before front vowels.

	ZAMBUK	WUYO
(41) 'Dala pulled'	[dala wa kədi]	[dala wa kədi]
(42) 'Dala pointed'	[dala wa wud̄i]	[dala wa wud̄i]

Comparing 41 and 42 with 36 and 40, it appears that there is a contrast in Zambuk between [ji] and [di] and between [ĵi] and [d̄i] which would force us to recognize alveolars and palatals as separate phonemes, undesirable as this interpretation might be. It should be noted, however, that all apparent exceptions to the palatalization rule involve word final [i], which we have postulated to be the morphophoneme |ə|. If palatalization in Zambuk is simply a case of assimilation which takes place only before front vowels, and if one accepts the view that the apparent exceptions actually end in |ə|, a central vowel, then the proper allophones of the alveolars can be accounted for without assuming a new phonemic distinction. The morphophonemic transcription |kədə| for [kədi] and |di| for [ji] is, moreover, bi-unique, although with the surprising result that the difference between [di] and [ji] is seen as a difference in final vowel and not in final consonant.[12]

What is remarkable about the above is that the environment for the allophonic palatalization rule—which is simply a matter of subphonemic assimilation—must be stated not in terms of phonemes but in terms of underlying morphophonemes. Palatalization takes place only before an /i/ which is morphophonemically |i| and not before the phonemically identical /i/ which is morphophonemically |ə|. This of course includes all those words ending in the morphophoneme |ə| where

[12] In Wuyo, on the other hand, the transcription is not bi-unique, since both |də#| and |di#| are pronounced [di].

the schwa never occurs as such. Thus, although a phonemic distinction does not exist in final position between /i/ and /ə/, the morphophoneme |ə| does remain distinct from |i| in that position, not only in terms of alternation pattern but also in its phonological influence on neighboring sounds. It is especially this matter of the distinct phonological influences of |ə| and |i| that convinces me that final |ə| has reality (call it psychological if you will) for Tera speakers.

3.2. In closing, I would like to point out an important implication of the psychological reality of morphophonemes for interpretation in historical linguistics. It has generally been held that once historically distinct phonemes have merged, they thereafter lose their separate identity. The belief that it is not possible synchronically to recognize the distinct origin of merged members of a new phoneme underlies the principle of irreversibility of merger, which has often been relied on to establish relative chronology of sound change. Halle has challenged this position, arguing that 'phonemes that have fallen together at one stage in the evolution of a language may at a later stage emerge again as completely distinct entities' (1962:70). In support of Halle's heresy, I ask whether it is reasonable to accept uncritically the classic doctrine that 'once phonemes merge ... their subsequent phonological history is for all times identical' (Hoenigswald 1960:117), when we have shown that sounds can continue to have a separate existence as real phonological units on the morphophonemic level in spite of having been merged into a single phoneme. Since the phonological behavior of merged phonemes is not identical synchronically, there is no more reason to believe that their future phonological history must necessarily be identical.

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